



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification: H04L 12/56, H04L 12/46, H04L 12/66, H04Q 11/04	A1	(11) International Publication Number: (43) International Publication Date:	WO 00/62489 19 October 2000 (19.10.2000)
--	----	--	---

(21) International Application Number: (22) International Filing Date: (30) Priority Data: (60) Parent Application or Grant	PCT/FI00/00324 14 April 2000 (14.04.2000) 990827 14 April 1999 (14.04.1999) FI TELEFONAKTIEBOLAGET LM ERICSSON (publ) [/]; (). TURTIAINEN, Esa [/]; (). TURTIAINEN, Esa [/]; (). BORENTUS & CO OY AB ; ().	Published
--	---	-----------

(54) Title: ROUTING BETWEEN COMMUNICATION NETWORKS
(54) Titre: ACHEMINEMENT ENTRE RESEAUX DE COMMUNICATION

(57) Abstract

The present invention relates to a method of routing a call between a circuit switched network and a packet switched network in a network system comprising a media gateway between the circuit switched network and the packet switched network. In the method all routing procedures for the call are handled by a separate routing controller common for several media gateways. The invention relates further to an arrangement for performing the same.

(57) Abrégé

Cette invention a trait à une méthode d'acheminement d'un appel entre un réseau à commutation de circuit et un réseau à commutation de paquets dans un système en réseau comprenant une passerelle pour supports entre le réseau à commutation de circuit et le réseau à commutation de paquets. Dans le cadre de cette méthode, toutes les modalités d'acheminement de l'appel sont prises en charge par une unité de commande d'acheminement commune à plusieurs passerelles pour supports. L'invention porte également sur un dispositif permettant la mise en oeuvre de cette méthode.

PCT

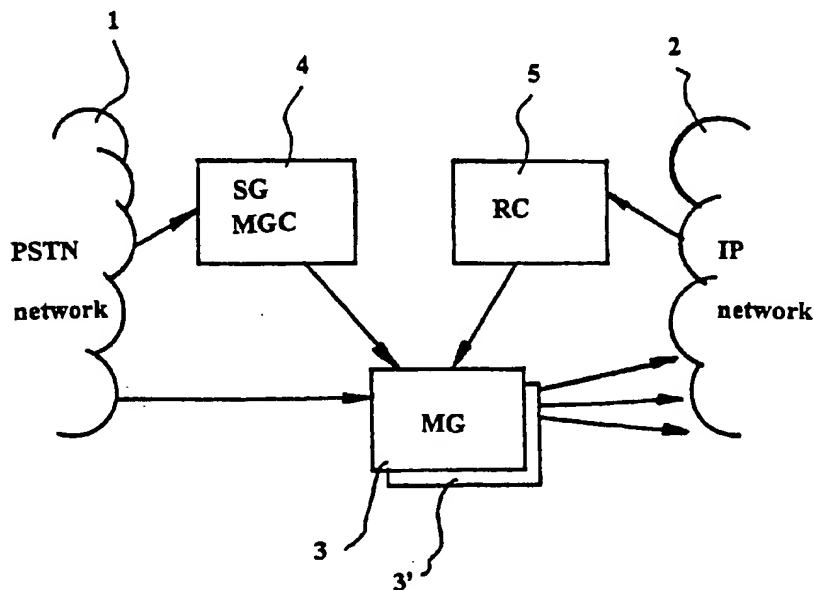
WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : H04L 12/56, 12/66, 12/46, H04Q 11/04		A1	(11) International Publication Number: WO 00/62489
			(43) International Publication Date: 19 October 2000 (19.10.00)
(21) International Application Number: PCT/FI00/00324			(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
(22) International Filing Date: 14 April 2000 (14.04.00)			
(30) Priority Data: 990827 14 April 1999 (14.04.99) FI			
(71) Applicant (for all designated States except US): TELEFON-AKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE).			
(72) Inventor; and (75) Inventor/Applicant (for US only): TURTIAINEN, Esa [FI/FI]; Kartanonkuja 8 H, FIN-02360 Espoo (FI).			
(74) Agent: BORENTUS & CO OY AB; Kansakoulukuja 3, FIN-00100 Helsinki (FI).			Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: ROUTING BETWEEN COMMUNICATION NETWORKS



(57) Abstract

The present invention relates to a method of routing a call between a circuit switched network and a packet switched network in a network system comprising a media gateway between the circuit switched network and the packet switched network. In the method all routing procedures for the call are handled by a separate routing controller common for several media gateways. The invention relates further to an arrangement for performing the same.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

ROUTING BETWEEN COMMUNICATION NETWORKS

FIELD OF THE INVENTION

The present invention relates to a method of routing in telecommunication networks, and more precisely to a method of routing between a telephone network and a data network. The invention relates further to an arrangement for performing the routing operations between two different networks.

BACKGROUND OF THE INVENTION

An interfacing gateway or access node is required in the communication path or route between two different communication networks. For instance, an interfacing access node is required in cases where the other network is a telephone network, such as a Public Switched Telephone Network (PSTN) and the other network is a data network, such as a packet switched data network (PSDN). Examples of the packet switched networks include the global connectionless Internet utilising TCP/IP (Transport Control Protocol/Internet Protocol) protocol suite and various Intranet applications.

One possibility to implement the access node AN between the PSTN and the packet switched data network is a routing device referred to as Network Access Server (NAS). NAS can be defined as a device which receives calls from the PSTN and translates the calls into Internet IP packet form.

At least some degree of routing functionality is required in the communication network system for the transmission of the data packets over the data network in order to be able to

5 sent the data packets to a correct next router and finally
to a correct destination address. This functionality is
usually integrated to the NAS, or then all traffic goes
10 through a separate router especially and solely arranged to
accomplish the routing tasks. Routing protocols based on
international agreements are used in order to be able to
provide this functionality. The routing protocols are used
15 to adapt dynamically to the variations in networks
structures and also to the possible failures occurring
20 during various stages of transmission of the data packets.

SUMMARY OF THE INVENTION

25 The routing protocols, like OSPF (Open Shortest Path First)
and BGP (Border Gateway Protocol), are substantially complex
and do not suit especially well to simple network elements
the NAS otherwise would utilise. Thus the integration of the
routing protocols to each NAS unit of the network system is
30 in most cases an excessively complex task, and requires
otherwise unnecessary modifications and/or additional
hardware and/or software implementations to each of the
access servers in the system.

35 In case separate routers are used the routing causes one
extra step, and every packet has to be handled still once in
25 the NAS. This may cause delays in the traffic and increases
the risk for failures.

40 The current development is leading towards a model in which
the PSTN network control is separated from the NAS to a
45 signalling gateway (SG; SS7 to ISUP over IP conversion) and
Media Gateway Controller (MGC) handling the PSTN call
related control, whereby NAS remains only as a simple Media
Gateway (MG). A MG typically contains only one generic DSP
50 (Digital Signal Processor) that can be programmed

5 dynamically to form a modem or a voice over IP codec. This
simplifies the structure of the MG (i.e. the access node for
media) a lot, but does not solve the routing problem.

10 5 It is an object of the present invention to overcome the
disadvantages of the prior art solutions and to provide a
new type of solution for routing calls between different
15 networks.

20 10 Another object of the present invention is to provide a
method and arrangement by means of which the structure of
the access node can be made less complex and unnecessary
double processing of the data packets can be avoided.

25 15 According to a first aspect, the objects are obtained by a
method of routing a call between a circuit switched network
and a packet switched network in a network system comprising
a media gateway between the circuit switched network and the
30 packet switched network, wherein routing procedures for the
20 call are handled by a separate routing controller common for
several media gateways.

35 The routing controller can give routing information to an
appropriate media gateway concerning the destination of the
25 call traffic. The routing information may comprise the IP
interface to be used and the IP address of the next router
40 in the packet switched network. The routing controller for
the packet switched network and signalling controller for
the circuit switched network may also form a symmetric
45 30 structure relative to the media gateway. The call can
originate both from the circuit switched network side and
the packet switched network side.

50 According to another aspect the invention provides an
35 arrangement in a communication network system comprising: a

5 circuit switched network; a packet switched network; a
plurality of media gateways between the networks; a
10 signalling controller for handling circuit switched traffic;
and a separate routing controller for handling packet
5 switched traffic routing, said separate routing controller
being common to said plurality of media gateways.

15 The routing controller and the signalling controller can
form a symmetric structure relative to the media gateway.
10 The plurality of media gateways can also be arranged in a
stack.
20

According to a further aspect the invention provides a
routing controller for a communication network system
25 comprising a circuit switched network, a packet switched
network, a plurality of media gateways between the networks,
and a signalling controller for handling circuit switched
traffic, wherein the routing controller is arranged to form
30 a separate routing controller for handling packet switched
20 traffic routing such that said separate routing controller
is common to said plurality of media gateways.

35 Several advantages are obtained by means of the present
invention, since the solution provides a simplified
25 structure for the media gateway between different
communications networks. Since the required media gateway
40 apparatus is less complex than in the prior art solutions,
it is thus economically more advantageous and also more
reliable in use and less vulnerable for hardware and/or
45 software failures. The proposed solution does not have any
disadvantageous effects in the performance or functionality
of the system since the traffic is separated to different
outgoing interfaces. The proposed system adapts well to any
50 dynamic changes in the network system. In addition, by means
35 of the invention it becomes more easy to stack media gateway

units to a tight space.

In the following the present invention and the other objects and advantages thereof will be described in an exemplifying manner with reference to the annexed drawings, in which similar reference characters throughout the various figures refer to similar features.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic presentation of network system including a telephone network and a data network and linking apparatus there between; and

Figure 2 discloses signalling flow according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematical presentation of one network system including a PSTN 1, IP network 2 (e.g. the TCP/IP Internet or an intranet application) and an access node or a gateway apparatus therebetween. The arrows indicate the signalling directions in situation where a call has been initiated by a terminal of the PSTN (not shown). In this example the gateway apparatus comprises a plurality of media gateways 3, 3', a signalling gateway SG (for SS7 to ISUP over IP conversion) and media gateway controller MGC handling call related control 4.

Each MG 3,3' may contain only one generic DSP (Digital Signal Processor) which can be programmed dynamically to form a modem or a voice over IP codec. Thus the structure of the MG can be made substantially simple, which reduces remarkably the costs of the MG and also increases the reliability of the MG. As disclosed, the MGs can be stacked

5 in a substantially tight space in a manner similar to
ordinary telephone exchanges. It is noted that even though
figure 1 discloses only two MGs, the number of them could be
10 substantially higher.

5

The gateway apparatus is further provided with a separate
routing controller RC 5, the arrangement being such that the
15 routing is separated similarly to the signalling gateway and
media gateway controller 4 to the routing controller 5. In
10 other words, the system is "symmetric" relative to the MGs in
view of the PSTN and the IP network. Thus the former access
20 servers are now simplified to form only media gateway units
3, 3'.

25 15 In a manner similar to the SG+MGC unit 4, the routing
controller unit 5 is common for several media gateway units
3, 3'. The routing controller 5 is arranged to communicate to
the IP network 2 by using appropriate routing protocols,
30 such as the OSPF and the BGP, and to give required routing
20 orders to the particular media gateway unit 3 or 3'. The
main information required by the particular media gateway is
the current situation concerning the destination of the
35 traffic originating in the PSTN side and coming via a
certain PSTN line. The required information typically
25 consists of indication of correct IP interface which should
be used and the IP address of the next router (i.e. the next
40 "hop" in the data network).

An example of the routing protocols is the OSPF routing
45 30 protocol (RFC2178) which is one of the IP protocols, more
precisely IP protocol number 89. All those IP packets that
are coming to the media gateway MG and are of protocol 89
are tunnelled to the routing controller RC. The routing
50 controller 5 sees all MG interfaces as its own interfaces,
35 and when something is sent to a RC interface, it is

5
10
15
20
25
30
35
40
45
50
55

tunnelled to the MG and sent there. There are 5 types of OSPF packets and they all must fit in to an IP packet of size of 576 bytes (in case operated according to RFC2178 appendix A). Another typical protocol is RIP (RFC1723) that is a UDP based protocol (a transport level datagram layer above the IP layer, port 520). A similar tunnelling approach works in this as well when the traffic from UDP port 520 is forwarded to the routing controller.

10
20
25
30
35
40
45
50
55

The media gateway MG unit can be made as simple as possible by removing both IP routing handling and call control from it. This does not affect negatively to the performance or the functionality of the system because the traffic is separated to different outgoing ("egress") interfaces in a manner similar to a router. The system also adapts to any dynamic changes in the network in a manner similar to a router.

30
35
40
45
50
55

The PSTN users often have a dynamically assigned IP address. In this case the RC must "advertise" (i.e. announce) these addresses so that the other routers of the system are enabled to transmit the data packets to a correct MG.

25
30
35
40
45
50
55

It is also possible for an PSTN user to have a known IP network address or a subnet of an IP network. In this case the RC can call back to the PSTN telephone number associated with this IP address when somebody tries to reach said IP address from the IP network side. In case the connection has already been setup, this case will be like the one already discussed above.

50
55

The RC advertises routes to the fixed network addresses even in instances where the connections are down i.e. disconnected. The RC can accomplish this by using one, some or available ports based on local policy (for instance, some

5 MGs may be closer to the destination in the PSTN). When a
packet addressed to a predefined destination arrives, the MG
10 routes it to a special dynamic interface that makes the SG
to set-up the requested telephone call. This may involve
5 utilisation of one additional server, e.g. an AAA server
(Authentication, Authorisation and Accounting server; most
often used protocol for an AAA server being RADIUS) that
15 maintains customer information in a database which is common
for the SC and the RC.

10

20 Figure 2 discloses signalling flows 11 to 13 (numbers in
circles) for the above described solution. At flow step 11
the AAA server 7 defines fixed routes and the RC 5 controls
that the MG 3 becomes advertised of the addresses and sets
25 up the MG 3 to start a connection should a data packet
arrive. In flow step 12 a data packet arrives, whereafter
the MG 3 contacts SG/MGC 4 in order to establish a
connection. SG 4 ask for a telephone number from the AAA
30 server 7 and establishes the connection to that number. Then
20 the MG 3 forwards the data packet to the established
connection 13. In case the same route is advertised in many
MGs, it must in most cases be ensured that only one
35 connection is established at the same time. However, there
may be instances where it could be desirable to establish
25 several connections, e.g. such that the user can receive
several calls at the same time and/or that the bandwidth is
40 increased by this and/or that the call may go to many
geographical locations at the same time.

45 30 Thus the invention provides an apparatus and a method by
which a significant improvement can be achieved in the area
of routing between different networks. It should be noted
that the foregoing exemplifying embodiments of the invention
50 are not intended to restrict the scope of the invention to
35 the specific forms presented above but the present invention

5

is meant rather to cover all modifications, similarities and
alternatives which are included in the spirit and scope of
the present invention, as defined by the appended claims.

10

15

20

25

30

35

40

45

50

55

Claims

1. A method of routing a call between a circuit switched network and a packet switched network in a network system comprising a media gateway between the circuit switched network and the packet switched network, wherein routing procedures for the call are handled by a separate routing controller common for several media gateways.
2. A method in accordance with claim 1, wherein the routing controller gives routing information to an appropriate media gateway concerning the destination of the call traffic.
3. A method in accordance with claim 2, wherein the routing information comprises the IP interface to be used and the IP address of the next router in the packet switched network.
4. A method in accordance with any of the preceding claims, wherein the routing controller for the packet switched network and signalling controller for the circuit switched network form a symmetric structure relative to the media gateway.
5. A method in accordance with any of the preceding claims, wherein the call comes to the media gateway from the circuit switched network side.
6. A method in accordance with any of claims 1 to 4, wherein the call comes to the media gateway from the packet switched network side and is destined to a terminal connected to the circuit switched network.
7. A method in accordance with claim 6, wherein, in case the terminal has a dynamically assigned IP address, the IP

5 address of the terminal is advertised by the routing controller to routers of the system.

10 8. A method in accordance with claim 6, wherein, in case
5 the terminal has a known IP address, the routing controller calls back to a called circuit switched terminal number associated with said IP address.

15 9. An arrangement in a communication network system
10 comprising:

20 a circuit switched network;

a packet switched network;

a plurality of media gateways between the networks;

a signalling controller for handling circuit switched

25 traffic; and

a separate routing controller for handling packet switched traffic routing, said separate routing controller being common to said plurality of media gateways.

30 10. An arrangement in accordance with claim 9, wherein the routing controller and the signalling controller form a symmetric structure relative to the media gateway.

35 11. An arrangement in accordance with claim 9 or 10, wherein
25 the plurality of media gateways is arranged in a stack.

40 12. A routing controller for a communication network system comprising a circuit switched network, a packet switched network, a plurality of media gateways between the networks,
45 30 and a signalling controller for handling circuit switched traffic, wherein the routing controller is arranged to form a separate routing controller for handling packet switched traffic routing such that said separate routing controller is common to said plurality of media gateways.

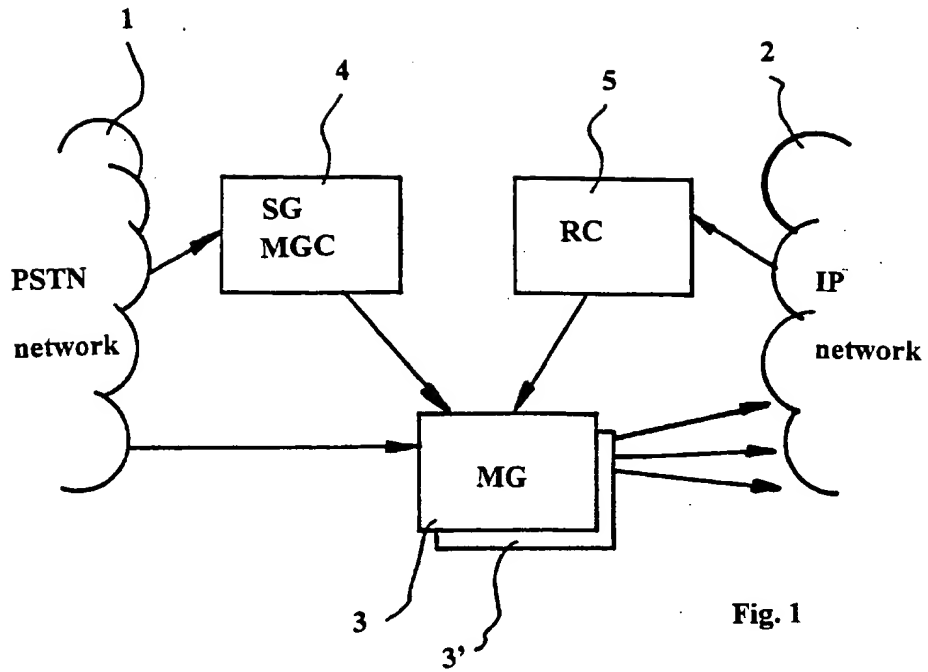


Fig. 1

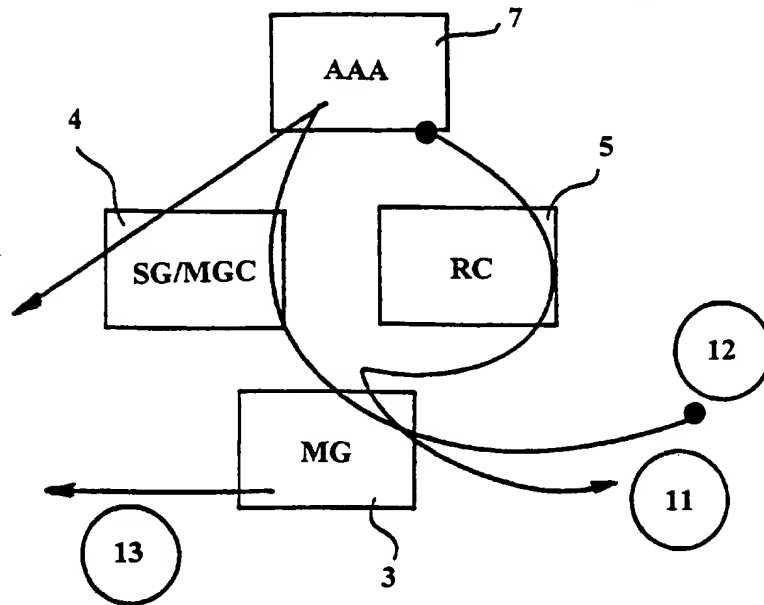


Fig. 2

INTERNATIONAL SEARCH REPORT

International Application No.
PC, FI 00/00324

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/56 H04L12/66 H04L12/46 H04Q11/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 546 452 A (ANDREWS G W ET AL) 13 August 1996 (1996-08-13) column 2, line 35 - column 3, line 10 column 5, line 20 - line 50 column 7, line 25 - line 41; figures 1-3	1-6,8-12
Y	---	7
X	EP 0 880 255 A (NORTHERN TELECOM LTD) 25 November 1998 (1998-11-25) column 4, line 3 - line 47 column 6, line 37 - line 57 column 8, line 45 - column 9, line 5 column 9, line 25 - line 43; figure 1 ---	1-6,8-11
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
 "E" earlier document but published on or after the international filing date
 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
 "O" document referring to an oral disclosure, use, exhibition or other means
 "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
 "A" document member of the same patent family

Date of the actual completion of the international search

25 July 2000

Date of mailing of the international search report

28. 08. 2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentstein 2
NL - 2280 HV Rijswijk
Tel: (+31-70) 340-2040, Tx 31 851 epo nl
Fax: (+31-70) 340-3018

Authorized officer

M. Eddin/EE

INTERNATIONAL SEARCH REPORT

International Application No
PC., FI 00/00324

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 474 427 A (AMERICAN TELEPHONE & TELEGRAPH CO) 11 March 1992 (1992-03-11) column 1, line 45 -column 2, line 13 column 4, line 1 - line 18 column 6, line 12 - line 40 ---	7
P,X	WO 99 62242 A (3COM CORP) 2 December 1999 (1999-12-02) page 2, line 1 - line 28 page 4, line 1 - line 24 page 5, line 10 - line 32 page 6, line 5 - line 29 page 7, line 12 - line 22; figures 3A-3C abstract ---	1-6,8-12
P,X	DATABASE WPI Section EI, Week 200015 Derwent Publications Ltd., London, GB; Class T01, AN 2000-167115 XP002901125 & JP 2000 022735 A (NIPPON DENKI ENG KK), 21 January 2000 (2000-01-21) abstract ---	12
P,X	HUITEMA CH ET AL: "An architecture for residential internet telephony service" IEEE INTERNET COMPUTING, vol. 33, May 1999 (1999-05), pages 73-82, XP002901126 the whole document ---	1-6,8-12
A	WO 97 28628 A (LABS OF ADVANCED TECHNOLOGIES INT CO) 7 August 1997 (1997-08-07) the whole document ---	1-6,8-12
A	ATASLAR ET AL: "Decentralized routing controller design for networks with more than two overlapping subnetworks" IEEE INTERNATIONAL CONF. ON SYSTEMS, MAN AND CYBERNETICS. INTELLIGENT SYSTEMS FOR THE 21ST CENTURY, vol. 4, 1995, pages 2960-2965, XP002901127 the whole document -----	7

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PL./FI 00/00324

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5546452	A	13-08-1996	AU 696984 B	24-09-1998
			AU 5357396 A	18-09-1996
			CA 2188875 A	06-09-1996
			EP 0758508 A	19-02-1997
			US 5878130 A	02-03-1999
			WO 9627254 A	06-09-1996
			US 5848143 A	08-12-1998

EP 0880255	A	25-11-1998	CA - 2205731 A	20-11-1998

EP 0474427	A	11-03-1992	US 5166931 A	24-11-1992
			AU 629486 B	01-10-1992
			AU 8340891 A	12-03-1992
			DE 69114090 D	30-11-1995
			DE 69114090 T	30-05-1996
			JP 4227150 A	17-08-1992
			JP 8031884 B	27-03-1996

WO 9962242	A	02-12-1999	AU 4223999 A	13-12-1999

JP 2000022735	A	21-01-2000	NONE	

WO 9728628	A	07-08-1997	AU 1851397 A	22-08-1997
			JP 2000504183 T	04-04-2000

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.